PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
IPB/129661		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DK2004/000513	26.07.2004	25.07.2003

International Patent Classification (IPC) or national classification and IPC
C05G3/08, C05F3/00, C05C9/02, C12M1/04, C07C273/00, A01K1/01

Applicant
P2A APS

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 6 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
25.05.2005	09.01.2006

Name and mailing address of the international preliminary examining authority:

European Patent Office - P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040 Tx: 31 651 epo nl
Fax: +31 70 340 - 3016

Authorized Officer

Rodriguez Fontao, M-

Telephone No. +31 70 340-3758

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000513

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))
- ☐ publication of the international application (under Rule 12.4)
- ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-48	as originally filed

Claims, Numbers

33	as originally filed
1-32	received on 28.05.2005 with letter of 25.05.2005

Drawings, Sheets

1/3-3/3	as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/DK2004/000513

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-17,20-32
	No:	Claims	18,19
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-32
Industrial applicability (IA)	Yes:	Claims	1-32
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference has been done to the following documents:

D1: DE 101 54 165 A (HOPP VOLLRATH) 15 May 2003 (2003-05-15)
D2: GB-A-1 567 773 (WELWYN HALL RES ASSOC) 21 May 1980 (1980-05-21)
D3: DD 227 949 A (ORGREB INST KRAFTWERKE) 2 October 1985 (1985-10-02)
D4: GB-A-1 483 150 (AN FORAS TALUNTAIS) 17 August 1977 (1977-08-17)

1. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 18 and 19 is not new in the sense of Article 33(2) PCT.

1.1 Independent claim 18 refers to a product defined in terms of a process. This product is essentially a fraction with low content in urea separated from waste matter after this waste matter has been treated for reversible urease inhibition. This product as such does not contain in itself any distinguishing feature in relation to the urea lean fraction obtained in any of the cited documents of the prior art D1 to D4 and could not be rendered novel by the fact that it is obtained by a novel process.

1.2 The same applies for the subject-matter of claim 19.

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-17 and 20-32 does not involve an inventive step in the sense of Article 33(3) PCT.

2.1 The subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT.

D2 is considered to be the closest prior art. This document describes a method of treating waste matter form animals, comprising collecting waste matter from the animals, inhibiting urease activity in said collected matter and, separating the so treated waste into a liquid urea rich fraction and a urea lean fraction (see claim 1).

The difference between the subject-matter of claim 1 and the teaching of D2 lies in the fact that the urease inhibition is of a reversible type in claim 1 whereas is irreversible in D2.

No technical effect has been shown by the applicant as been derivable from this difference nor a problem has been shown to have been solved by the application of this feature.

In this context, the problem to be solved in view of D2 can only be considered as providing a further process for treating animal waste.

Controlling the storing conditions of animal wastes containing urine by a method such as described in the present application, comprising: decreasing and/or increasing pH; buffering pH; decreasing and/or increasing temperature; decreasing and/or increasing pressure; decreasing and/or increasing ionic strength, or a combination thereof and therefore reversibly inhibiting the urease activity is a measure that the skilled person would apply without the exercise of an inventive skill when working with this kind of wastes (see for example D1, page 3, paragraph 18 or even D2, page 3, lines 94-96)

It is therefore considered that the subject-matter of claim 1 lacks an inventive step in the sense of Article 33(3) PCT.

2.2 The additional technical features of claims 2 to 8 is also considered to lack an inventive step. These technical features are either known from the prior art documents cited in the search report as mentioned in the previous communication (claims 2-4 and 6-8) or considered to lack an inventive step following the same reasoning as for claim 1 (claim 5).

2.3 The subject-matter of claim 9 lacks an inventive step in view of D2, the reasoning followed for claim 1 applying.

2.4 The additional technical features of claims 10 to 17 is also considered to lack an inventive step. The subject-matter of these claims are known from documents D1 and

D2 (as mentioned in the former communication).

2.5 Independent claim 20 is also a product-by-process claim. This product is essentially a fraction from waste matter rich in urea which presents a reversible inhibition of urease activity. The subject-matter of this claim lacks an inventive step following the same reasoning applying for independent claim 1.

2.6 The subject-matter of claims 21-23 is considered to be mere embodiments within the ambit of the main claim from which they depend. The technical features of said claims have not been shown to substantiate to a technical effect in a non-obvious manner nor a problem has been shown to have been solved by the application of these features. The subject-matter of these claims is either known from other documents (D1, D2) or considered to be common practice for a man skilled in the art . The patentability of these claims depends therefore upon the patentability of the main claim.

2.7 Independent claims 24, 25 and 26 lack an inventive step following the same reasoning used for claim 1

2.8 The subject-matter of claims 27 to 32 does not involve an inventive step in the sense of Article 33(3) PCT. The reasoning given in the former communication for these claims (original claims 28 to 31) still applies.

Re Item VIII

Certain observations on the international application

Claims 18 and 20 do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. Claims 17 and 21 try to define a product in terms of the method or the system by means of which they have been obtained. These claims remain nevertheless silent about the actual technical features which characterise these products.

PATENT CLAIMS

1. A method of treating waste matter from animals, the method comprising:

a) collecting waste matter from the animals;

b) inhibiting urease activity in said collected waste matter; and

c) separating said urease-activity inhibited waste matter into a urea-rich fraction essentially consisting of a liquid comprising urea and other components soluble in liquid manure and a urea-lean fraction;

wherein said inhibition comprises reversible inhibiting urease activity of said collected waste matter before said separation of said urease-activity inhibited waste matter into said urea-rich fraction and said urea-lean fraction.

2. The method according to claim 1 wherein said inhibition comprises irreversibly inhibiting urease activity.

3. A method according to claim 1 or 2 wherein said inhibition comprises a reversible inhibition of urease activity comprising treating said collected waste matter, said urea-rich fraction, or both, by a method comprising: decreasing and/or increasing pH; buffering pH; decreasing and/or increasing temperature; decreasing and/or increasing pressure; decreasing and/or increasing ionic strength, or a combination thereof.

4. A method according to any one of claim 1-3 wherein said inhibition comprises a irreversible inhibition of urease activity comprising treating said collected waste matter, said urea-rich fraction, or both, with an irreversible inhibitor, said inhibitor being selected among the group comprising:

urea compounds such as hydroxyurea, selenourea, phenylurea, thiourea;

hydroxamates such as amino acid hydroxamates, acetohydroxamate;

benzoeates such as p-substituted mercuribenzoate, p-chloromercuribenzoate, p-hydroxymercuribenzoate, iodosobenzoate;

sulfonates such as p-chloromercuribenzenesulfonate;

imides such as N-ethylmaleimide;

phosphor compounds such as phosphoramidate, phosphate;

monovalent ions such as F^-, Na^+, and K^+;

divalent metal ions such as Hg^{2+}, Cu^{2+}, Fe^{2+}, Co^{2+}, Zn^{2+}, Ni^{2+}, Mn^{2+}, Cd^{2+}, Ag^+, Mg^{2+} (weak), Ba^{2+},
preferably Cu^{2+}, Ag^+, or Pb^{2+}, or a combination thereof in form of at least one water-soluble salt, and/or at least one electrochemically-released ion;

trivalent ions such as As^{3+}; and

at least one nickel-complexing agent, preferably dimethylglyoxime, ethylenediamine, EDTA, or a combination thereof, and

other compounds such as beta-mercaptoethanol, iodine, suramin, phenylsulfinate, and furacin.

5. A method according to any one of claims 1-4 said method comprising:

a) reversibly inhibiting urease activity in said collected waste matter;

b) separating said reversibly urease-activity inhibited waste matter into a urea-rich fraction and a urea-lean fraction; and

c) irreversibly inhibiting urease activity in said urea-rich fraction.

6. A method according to any one of claims 1-5 wherein said urea-lean fraction is in form of a liquid, a solid, or a combination thereof, or in form of a dried solid.

7. A method according to any one of claims 2-6 wherein said irreversible inhibitor is recovered from said irreversibly urease-activity inhibited and separated urea-rich fraction.

8. A method according to any one of claims 1-7 wherein said waste-matter comprises faeces and liquid manure from farm animals.

BEST AVAILABLE COPY

9. A system for treating waste matter from animals, the system comprising:

a) a waste-matter collection means, said collection means being adapted to collect waste matter from the animals;

b) at least one separating means, said separating means being adapted to separate said collected waste matter into a urea-rich fraction and a urea-lean fraction; and

c) at least one urease-inhibitor supply means; said supply means being adapted to supply at least one urease inhibitor to said collected waste-mater, said urea-lean fraction, and/or said urea-rich fraction; said at least one urease-inhibitor supply means being adapted for supplying at least one urease inhibitor for reversible inhibiting urease activity of said collected waste matter before said separation of collected waste-matter and said reversible inhibition being for a period to control the duration of the urease inhibition.

10. The system according to claim 9 wherein said waste-matter collecting means comprises a floor of a stable.

11. A system according to claim 9 or 10 further comprising a waste-matter storage container, said waste-matter storage container being adapted for storing said waste matter.

12. A system according to any one of claims 9-11 wherein said at least one separation means comprises a sedimentation container, preferably a centrifuge.

13. A system according to any one of claims 9-12 further comprising a urea-rich fraction storage container, said storage container being adapted for storing said urea-rich fraction.

14. A system according to any one of claims 9-13 wherein said waste-matter collecting means comprises a flushing means for flushing said waste matter.

15. A system according to any one of claims 9-14 wherein said at least one urease-inhibitor supply means is adapted to

supply said at least one urease inhibitor to said stable floor, to said waste matter storage container, to said sedimentation container, to said flushing means, or a combination thereof.

16. A system according to any one of claims 9-15 wherein at least one urease-inhibitor supply means comprises means for recirculation of recovered inhibitor.

17. A system according to any one of claims 9-16 wherein said waste-matter comprises faeces and liquid manure from farm animals.

18. A urea-lean biogas fuel product, the product comprising a urea-lean fraction of waste matter from animals wherein the waste matter has been treated by a method as defined in claims 1-8, or wherein the waste matter has been treated in a waste-matter treatment system as defined in claims 9-17, said urea-lean biogas fuel product comprising little or no ammonia.

19. The product according to claim 18 wherein the urea-lean fraction exhibits substantially no urea.

20. A urea-rich animal waste-matter product, the product comprising urea produced from a urea-rich fraction of waste matter from animals wherein the waste matter has been treated by a method as defined in claims 1-8, or wherein the waste matter has been treated in a waste-matter treatment system as defined in claims 9-17, said urea-rich animal waste-matter product exhibiting a reversible inhibition of urease catalytic activity.

21. The product according to claim 20 wherein said urea-rich fraction exhibits substantially no urease activity, preferably less than 50 unit/ml, more preferred less than 20 unit/ml, most preferred less than 5 unit/ml.

22. A product according to claims 20 or 21 wherein said urea-rich fraction exhibits minor residues of irreversibly urease-activity inhibitors.

23. A product according to claims 20-22, the product comprising animal waste-matter indicators, preferably Na^+, K^+, Ca^{2+}, PO_4^{2-}, bilirubin, albumin, uric acid in ranges 200 mmol/l to 5 µmol/l.

24. A method of controlling the content of nitrogen in manure from animals wherein the manure is treated by a method as defined in claims 1-8, or wherein the manure is treated in a waste-matter treatment system as defined in claims 9-17.

25. A method of reducing gaseous ammonia in stables for animals, the method comprising controlling the content of nitrogen in manure from the animals by a method as defined in claim 24.

26. A stable for animals, the stable comprising a waste-matter treatment system as defined in claims 9-17 for treating manure from the animals.

27. A biogas reactor system for producing biogas from waste matter from animals, the system comprising a waste-matter treatment system as defined in claims 9-17.

28. A method of producing urea from waste matter of animals, the method comprising:

a) producing a urea-rich fraction of the waste matter from the animals by a method comprising:

i) collecting waste matter from the animals;

ii) inhibiting urease activity in said collected waste matter; and

iii) separating said urease-activity inhibited waste matter into a urea-rich fraction essentially consisting of a liquid comprising urea and other components soluble in liquid manure and

a urea-lean fraction; said inhibition comprising reversible inhibiting urease activity of said collected waste matter before said separation of said urease-activity inhibited waste matter into said urea-rich fraction and said urea-lean fraction; and

b) separating urea from said urea-rich fraction.

29. The method according to claim 28 wherein said waste matter comprises faeces and liquid manure from farm animals.

30. A method of producing urea formaldehyde, the method comprising:

a) producing urea from waste matter from animals as defined in claims 28-29; and

b) reacting said urea with methanal.

31. A method of producing biogas fuel from waste matter of animals, the method comprising:

a) producing a urea-lean fraction of the waste matter from the animals by a method comprising:

i) collecting waste matter from the animals;

ii) inhibiting urease activity in said collected waste matter; and

iii) separating said urease-activity inhibited waste matter into a urea-rich fraction essentially consisting of a liquid comprising urea and other components soluble in liquid manure and a urea-lean fraction; said inhibition comprising reversible inhibiting urease activity of said collected waste matter before said separation of said urease-activity inhibited waste matter into said urea-rich fraction and said urea-lean fraction; and

b) optionally drying said urea-lean fraction.

32. The method according to claim 31 wherein said waste matter comprises faeces and liquid manure from farm animals.